Day 163 **B Tier 10-a-day: Model Solutions**

1 Substitution

Work out the value of 6m + 14 when m = 4

Replace m with 4: 6 × 4 + 14
24 + 14 = 38
Answer: 38

2 Compound areas

A rectangular poster measures 23 cm by 14 cm.
A rectangle measuring 11 cm by 2 cm is cut out.
Work out the area that is left.

Whole area = 23 × 14 = 322
Area cut out = 11 × 2 = 22
322 − 22 = 300
Answer: 300 cm^2

3 Forming equations

I think of a number.
I add 5 and then multiply the result by 6.
The answer is 72.
Work out my number.

Let the number be n: 6(n + 5) = 72
Divide by 6: n + 5 = 12
Subtract 5
Answer: 7

4 Independent events

The probability that it rains on Saturday is 0.4.
The probability that it rains on Sunday is 0.3.
The events are independent.
Work out the probability that it rains on both days.

P(both) = P(Saturday) × P(Sunday)
0.4 × 0.3 = 0.12
Answer: 0.12

5 Circle theorems

PA and PB are tangents to a circle, centre O.
Angle APB = 80°.
Work out the size of angle PAB, marked y.
Give a reason for your answer.
The diagram is not drawn accurately.

PA = PB because tangents from a point to a circle are equal in length
Triangle PAB is isosceles
y = (180 − 80) ÷ 2 = 50°
Answer: y = 50°

6 Fractions and decimals

(a) Write $\frac{12}{25}$ as a decimal.

(b) Write $\frac{1}{6}$ as a recurring decimal.

For part (b), write down the first 8 decimal places and say which digits repeat.

(a) 12 ÷ 25 = 0.48
(b) 1 ÷ 6: use short division, adding zeros
1 ÷ 6 = 0.16666666...
The digit 6 repeats
Answer: (a) 0.48 (b) 0.16666666... (6 repeats)

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7 Isosceles triangles and Pythagoras

Triangle ABC is isosceles with AB = AC = 5 m.
The base BC = 6 m.
(a) Work out the perpendicular height of the triangle.
(b) Work out the area of the triangle.

(a) The height splits the base in half: 6 ÷ 2 = 3
$h^2 = 5^2 - 3^2 = 25 - 9 = 16$, so h = 4
(b) Area = ½ × 6 × 4 = 12
Answer: (a) 4 m (b) 12 m^2

8 Bounds

The length of a rectangle is 14 cm and its width is 19 cm.
Both measurements are correct to the nearest cm.
Work out the upper bound for the perimeter of the rectangle.

Upper bound of each side = value + 0.5: 14.5 cm and 19.5 cm
Perimeter = 2 × (14.5 + 19.5) = 68 cm
Answer: 68 cm

9 Cumulative frequency

The cumulative frequency graph shows the times taken by 40 students to complete a puzzle.
(a) Use the graph to estimate the median.
(b) Work out an estimate for the interquartile range.

(a) Median is at 40 ÷ 2 = 20: read across from 20 on the vertical axis to the curve, then down: 96
(b) Lower quartile at 10: 60. Upper quartile at 30: 112
IQR = 112 − 60 = 52
Answer: (a) 96 minutes (b) 52 minutes

10 Density

A lump of gold has a density of 19.3 g/cm^3 and a mass of 3860 g.
Work out its volume.

Volume = mass ÷ density
3860 ÷ 19.3 = 200
Answer: 200 cm^3